Headquarters U.S. Air Force

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SITE ST012, FORMER LIQUID FUELS STORAGE AREA

REMEDIAL ACTION

ST012 UPDATE

- ST012 startup schedule
- Operation sequence
- EBR Update
- Updated plume maps (PDI and Baseline sampling)
- Example of weekly report
- TMP variance
- Safety

ST012 REMEDIAL ACTION PROGRESS

REMEDIAL ACTION IN PLACE 22 Sep 2014

- Signed Record of Decision Amendment (RODA) — Sep 2013
- Final Remedial Design/Remedial Action(RD/RA) Work Plan — May 2014
- Horizontal Well Abandonment Complete — Mar 2014
- Well Drilling/Abandonment Complete — Apr 2014
- Baseline Groundwater Sampling Complete — Apr 2014
- Army Reserve Gate Upgrade — May 2014
- All Major Equipment Installed — Jul 2014

ST012 REMEDIAL ACTION PROGRESS

■ Pump Eductors Installed	Aug 2014
■ Utility Connections Complete	Aug 2014
■ Well field Piping Complete	Aug 2014
■ Process Equipment and Piping Complete	Aug 2014
■ City of Mesa Discharge Permit	Aug 2014
■ SEE Commissioning and Startup	Sep 2014

ST012 RA PROGRESS

ST012 UPCOMING REMEDIAL ACTION SCHEDULE

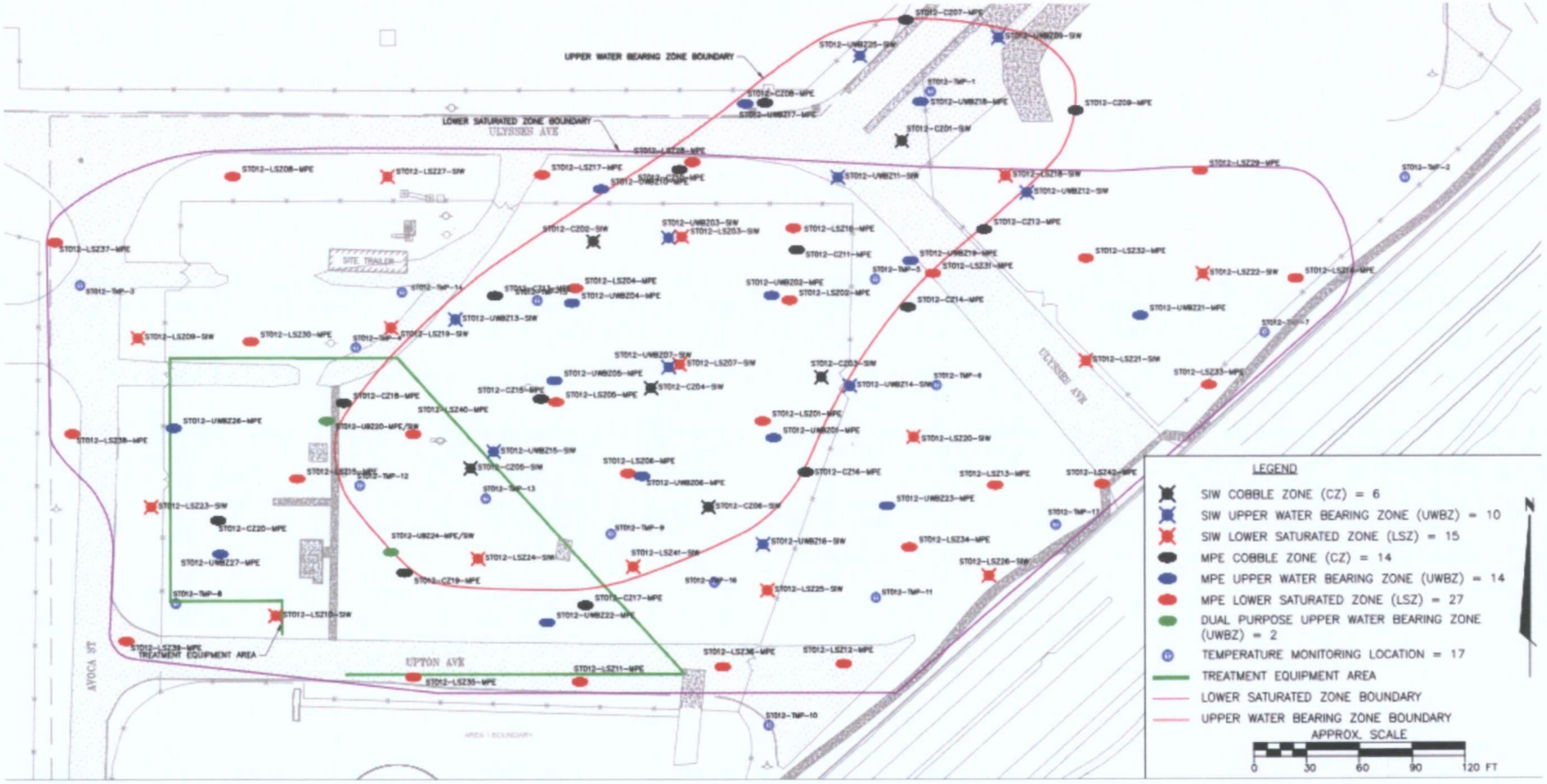
■ Operations Commencement	Sep 22 2014
■ Establish Pneumatic/Hydraulic Control	Sep 22-30 2014
■ Start Steam Injection	Sep 30 2014
■ Steam Heating and Extraction	Oct 2014-Aug 2015
■ Post Steam Extraction	Aug 2015-Nov 2015
■ Road and Cell Phone Lot Closure Ends	Dec 2015

ST012 INJECTION/EXTRACTION STARTUP STRATEGY

- Extraction wells started first
  - To establish hydraulic control
  - To capture LNAPL that is mobile at ambient temperatures
- Steam initiated first in LSZ, then UWBZ, and finally CZ
- Steam initiated first in areas at perimeter that are known to be clean then interior wells added incrementally

ST012 START UP

Step 1 – Turn on extraction wells and establish hydraulic control in all zones



ST012 START UP

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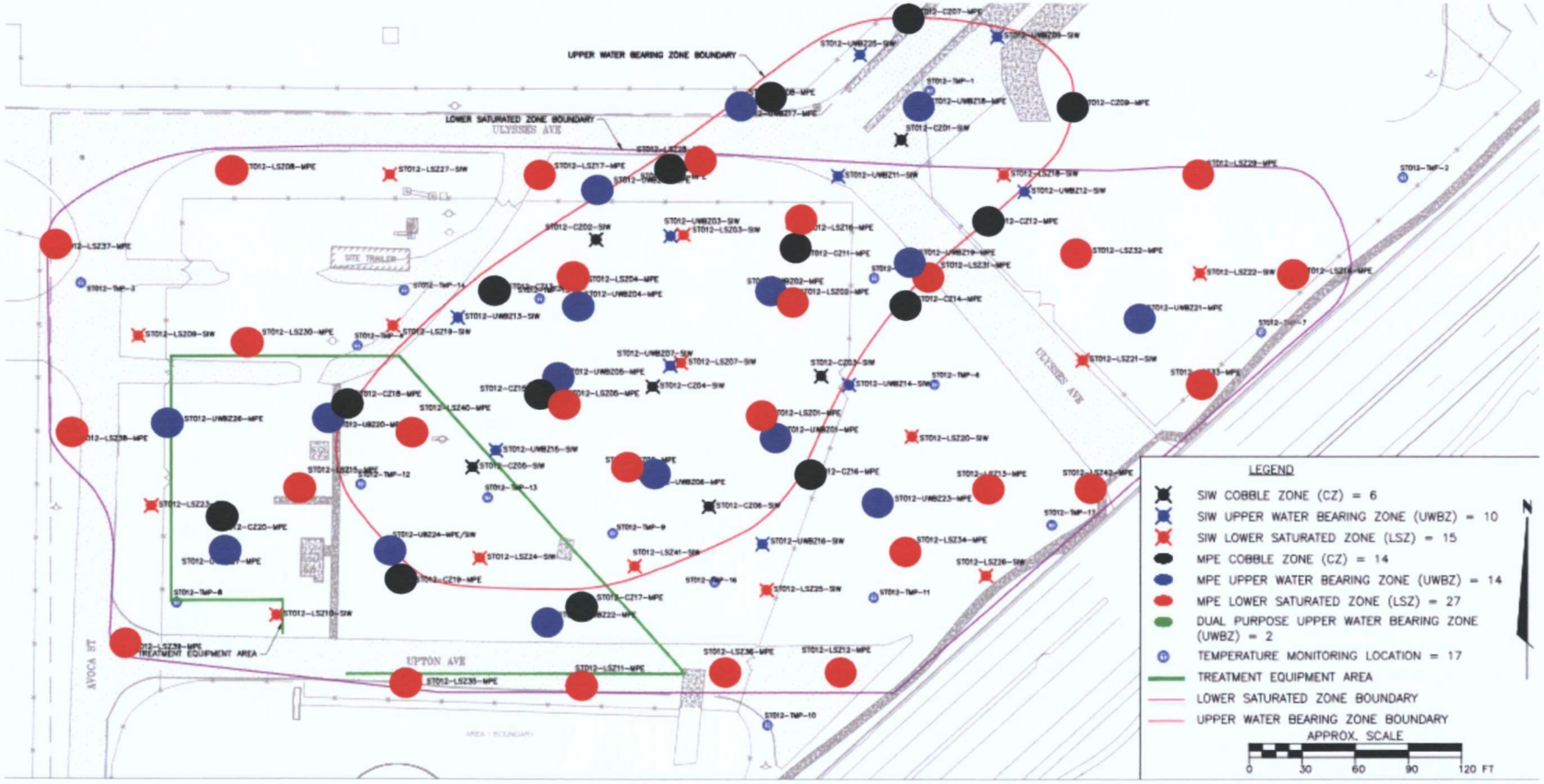
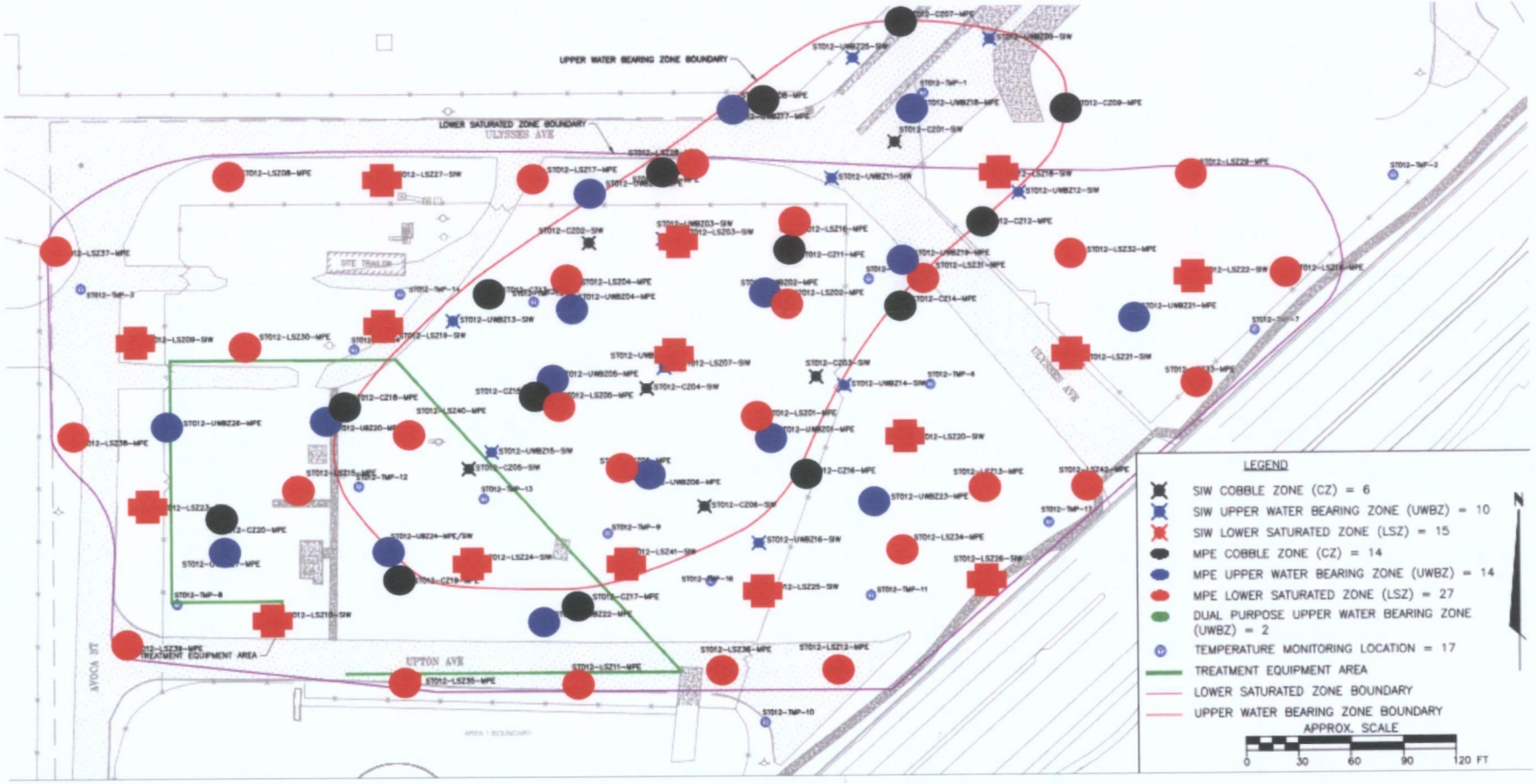


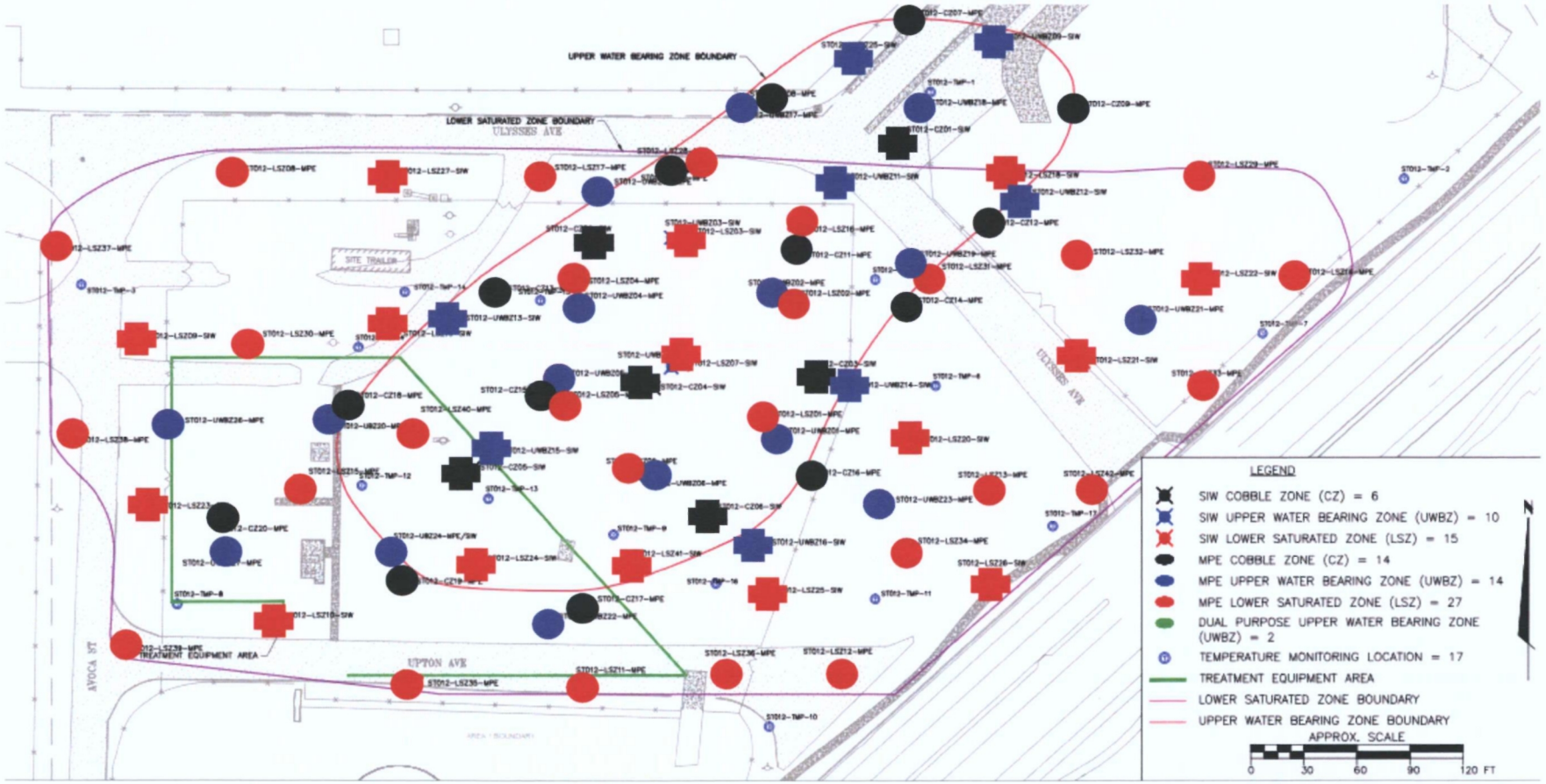
ST012 START UP

Step 2 – Turn on LSZ injection wells (some staging from good to worse areas)



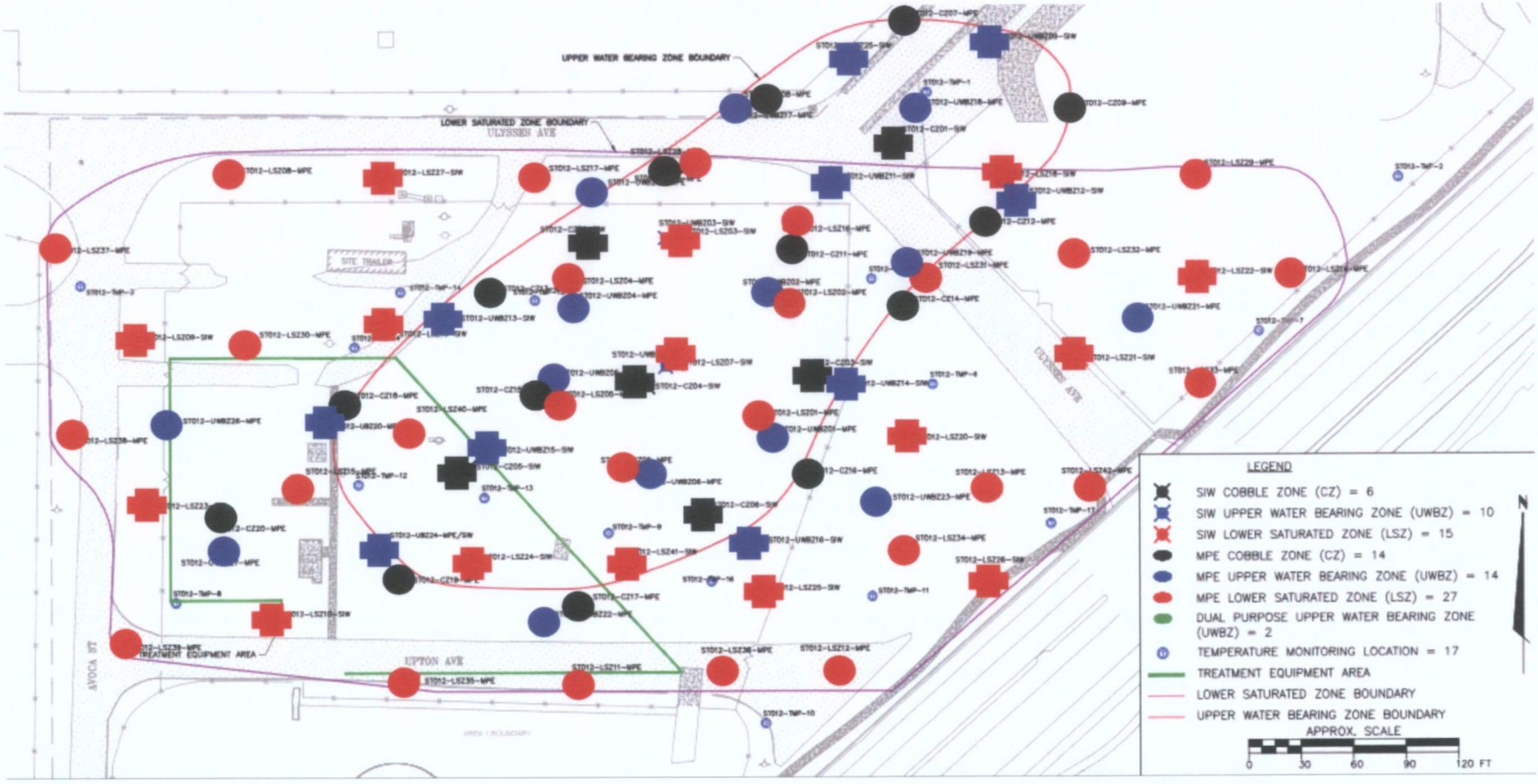
ST012 START UP

Step 3 – Turn on UWBZ and CZ injection wells (some staging from good to worse areas)



ST012 START UP

Step 4 – Transition two UWBZ extraction wells to injection wells

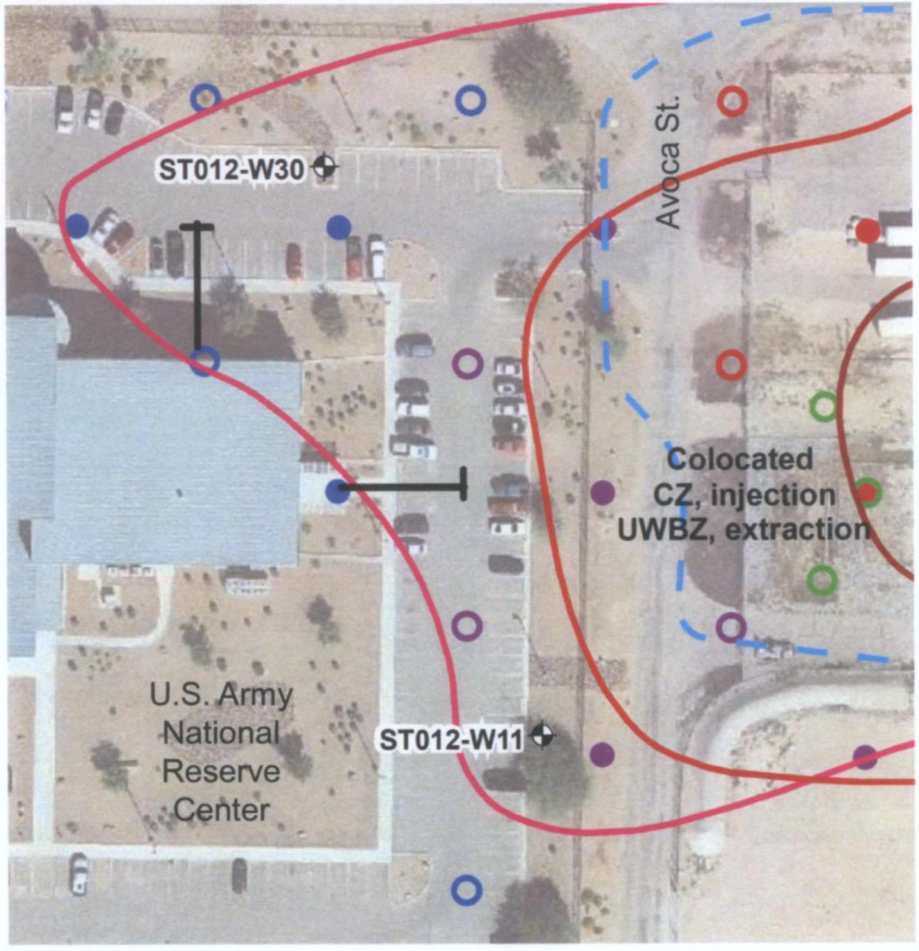


Site ST012 Enhanced Bioremediation Field Test

Test Plan Overview

- Enhanced bioremediation (EBR) used to address fuel contamination outside the Steam Enhanced Extraction (SEE) Target Treatment Zone (TTZ) and residual contamination after SEE operations
- EBR Field Test conducted to evaluate anaerobic biodegradation
  - Push-pull test using two monitoring wells on Army National Guard Property (ST012-W11 and ST012-W30)
  - Sulfate used as terminal electron acceptor (TEA)
  - Bromide used as a tracer
  - Initiated Shut-In Period on 22 July 2014; Pull-Phase conducted 6-9 September 2014

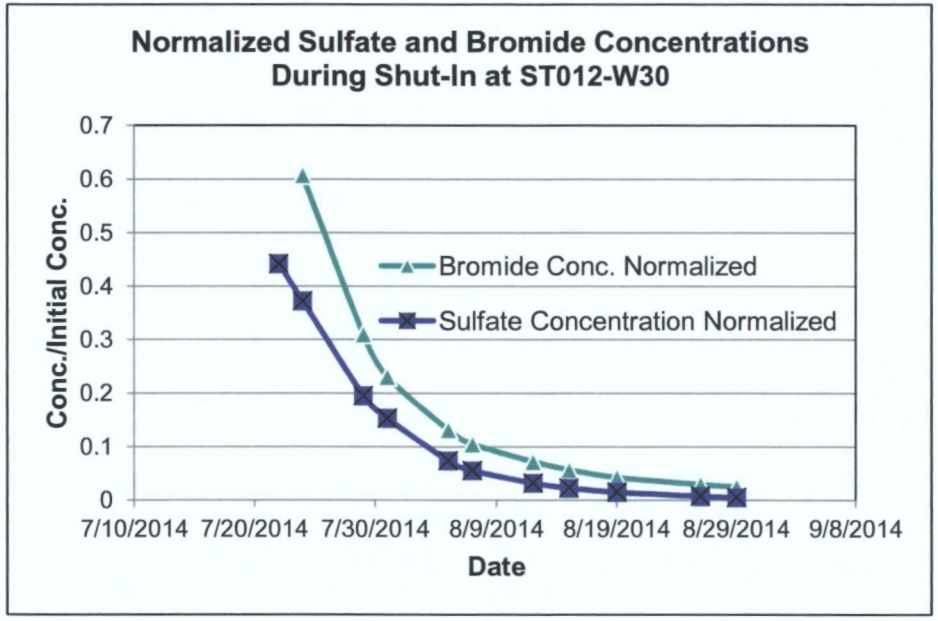
Site ST012 Enhanced Bioremediation Field Test



EBR field test Well locations in the western portion of the conceptual EBR well field

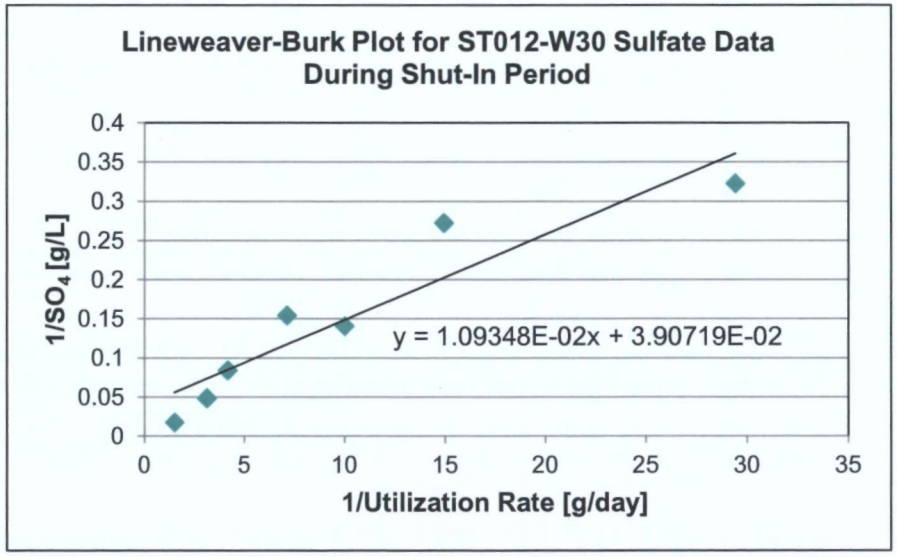
- CZ, extraction
- CZ, injection
- LSZ, extraction
- LSZ, injection
- UWBZ and LSZ, extraction
- UWBZ and LSZ, injection
- UWBZ, extraction
- UWBZ, injection
- Push-Pull Test Well
- CZ LNAPL extent
- UWBZ LNAPL extent
- LSZ LNAPL extent
- LSZ SEE Treatment Zone
- CZ/UWBZ SEE Treatment Zone
- Sloped Well

Site ST012 Enhanced Bioremediation Field Test



- Bromide and sulfate data collected over time during Shut-In Period

- Data used to estimate reaction rates



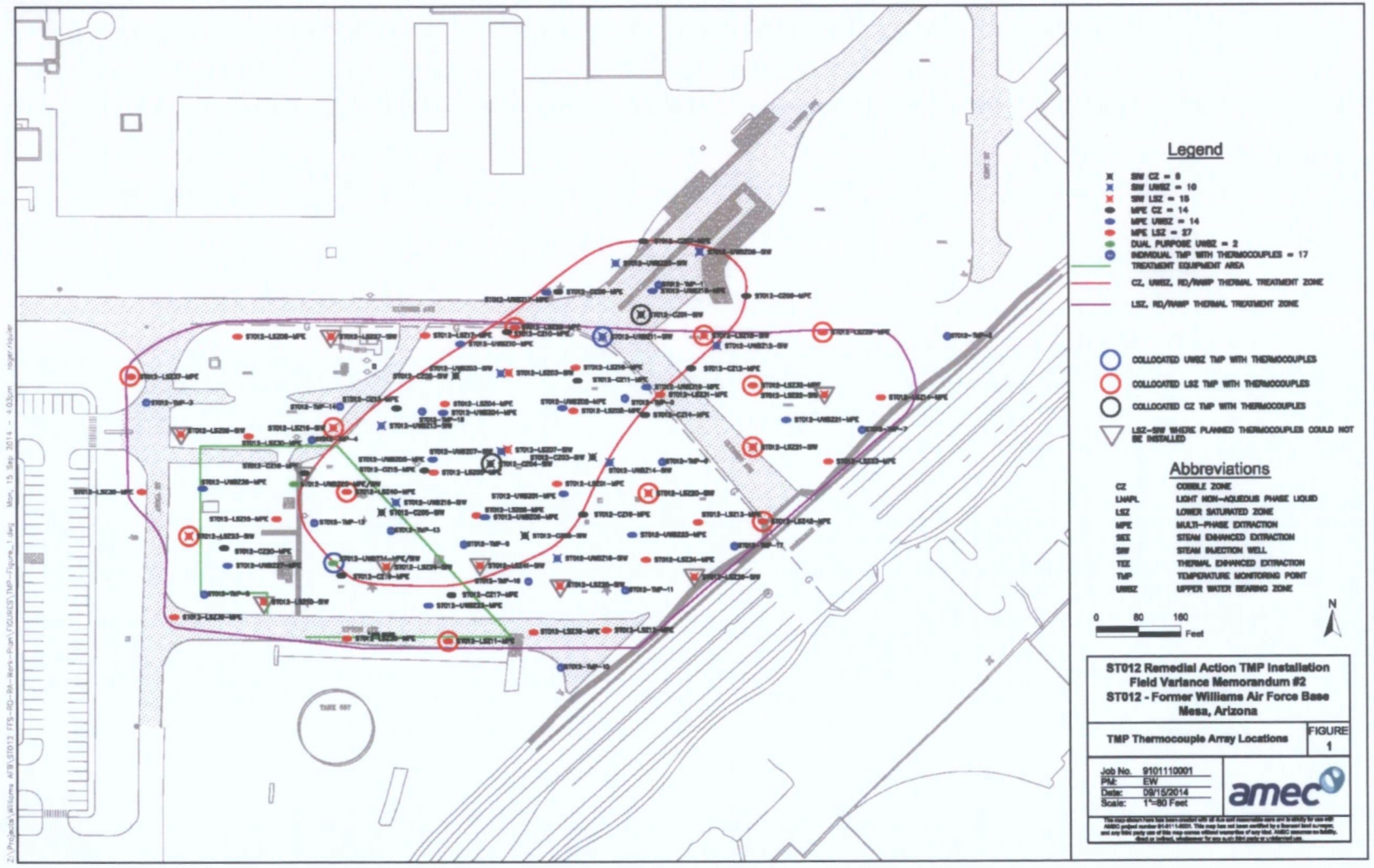
Site ST012 Enhanced Bioremediation Field Test

- Analytical and microbial samples are still being evaluated
- Data will be used to assess the proper dosing and delivery of the TEA to promote anaerobic degradation
- Analysis will help refine model kinetics and select an appropriate TEA
- EBR test results will be presented in follow on addendum to RD/RAWP

ST012 TMP LOCATION REVISIONS

- **Thermocouples could not be installed at all collocated TMP locations as originally planned in the RD/RAWP**
  - Water intrusion found at some locations indicating non-water-tight joints.
  - Blockage found at some locations that prevented insertion of thermocouples to the required depth
- **Summary of Modifications**
  - 17dedicated thermocouples were installed at all of the original independent TMP locations (not collocated with a SEE well). Additional grout and installation modifications were required at several locations. Independent TMPs are the primary source for mapping subsurface temperature at the site.
  - 12 dedicated thermocouple arrays were installed at collocated TMPs in LSZ wells. 18 were originally planned for SIWs (15 with Amendment 1 revisions). Final installation includes 5 SIWs and 7 MPE wells.
  - 2 mobile thermocouple arrays were installed at UWBZ wells as planned. The availability of viable locations is reduced .
  - 2 mobile thermocouple arrays were installed at CZ wells as planned. The availability of viable locations is reduced . Portions of collocated TMPs in CZ are not currently saturated. Leaks could become apparent during operation.
  - Known locations that are not viable for thermocouples have been capped at the ground surface.

ST012 TMP LOCATION REVISIONS



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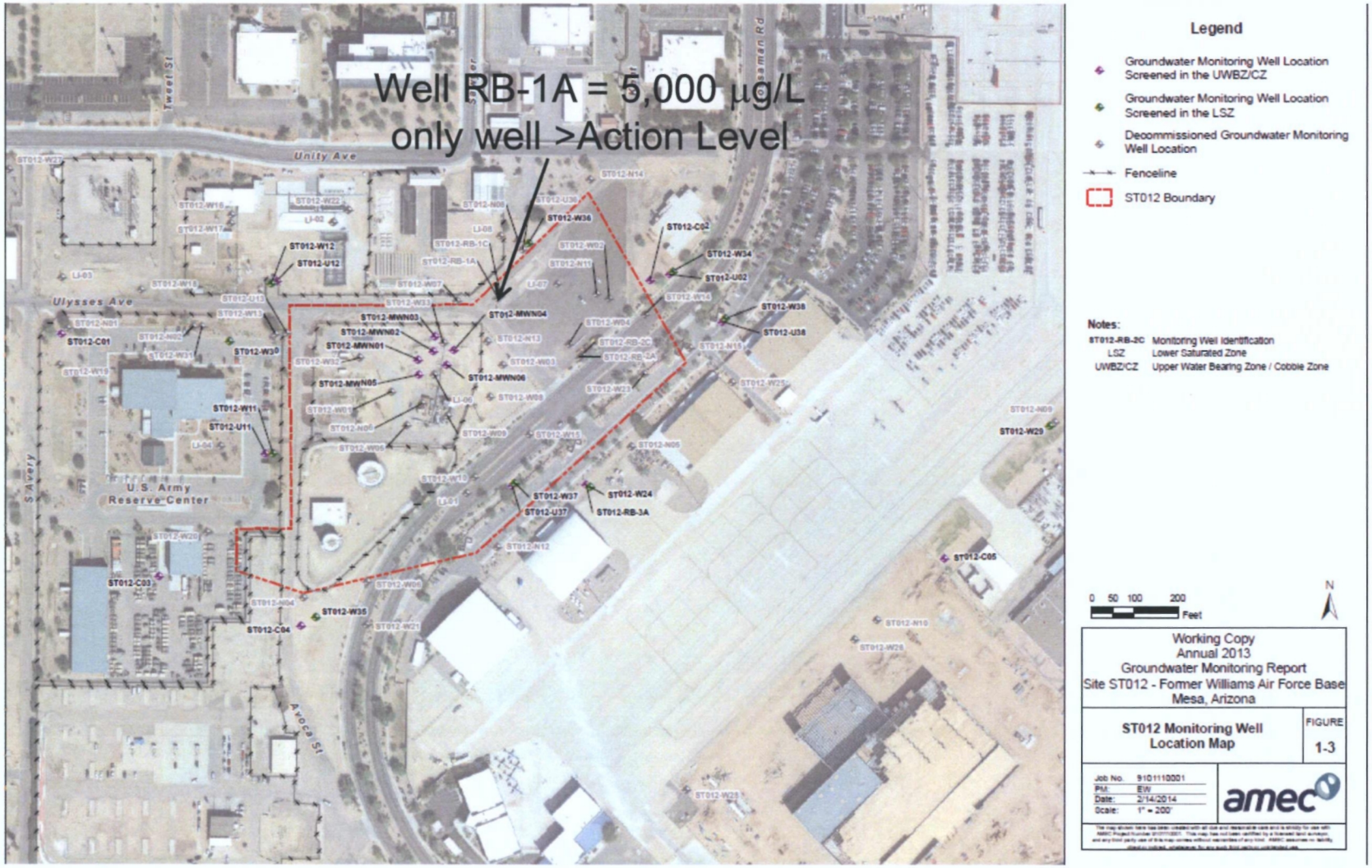
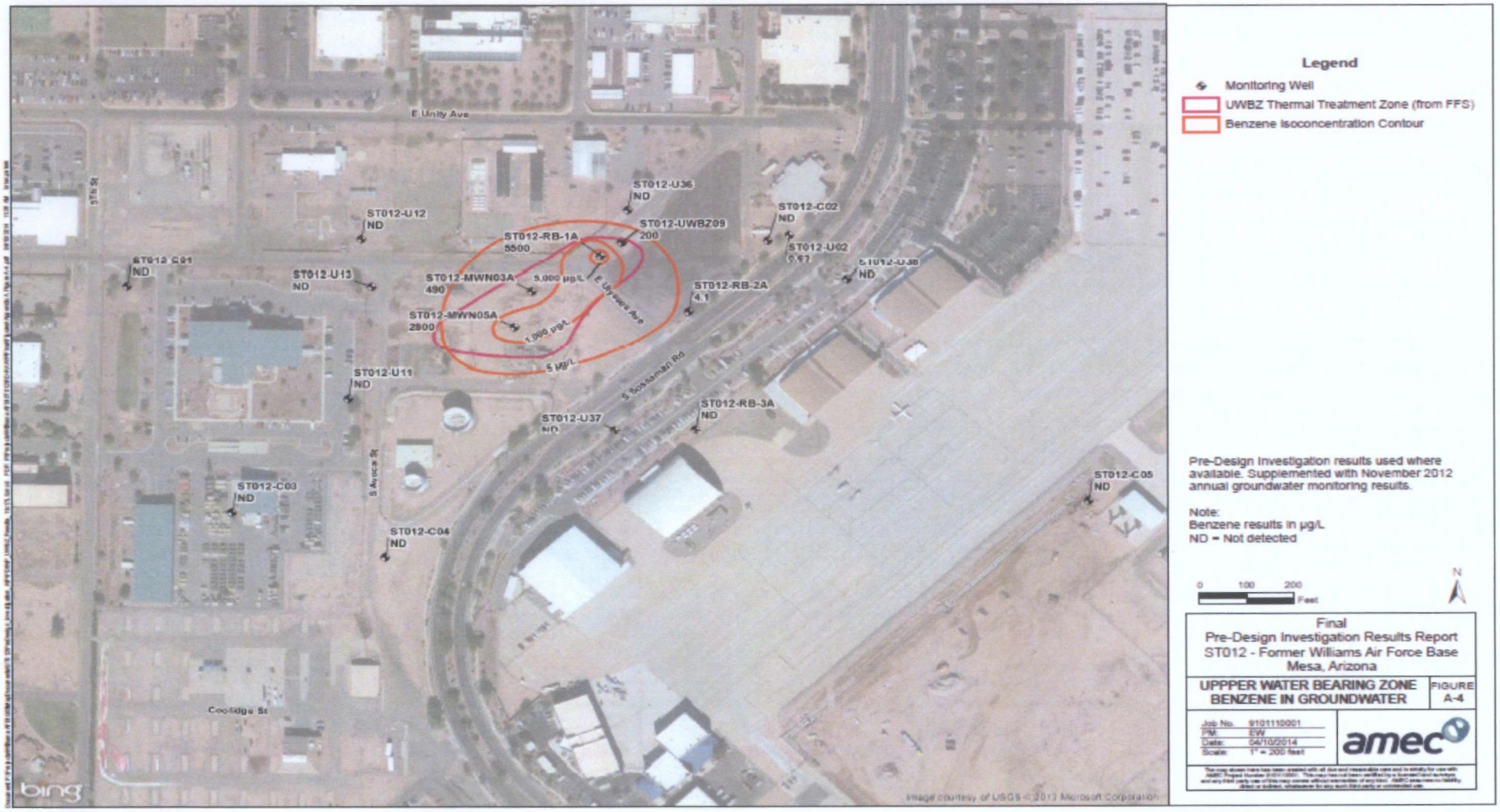
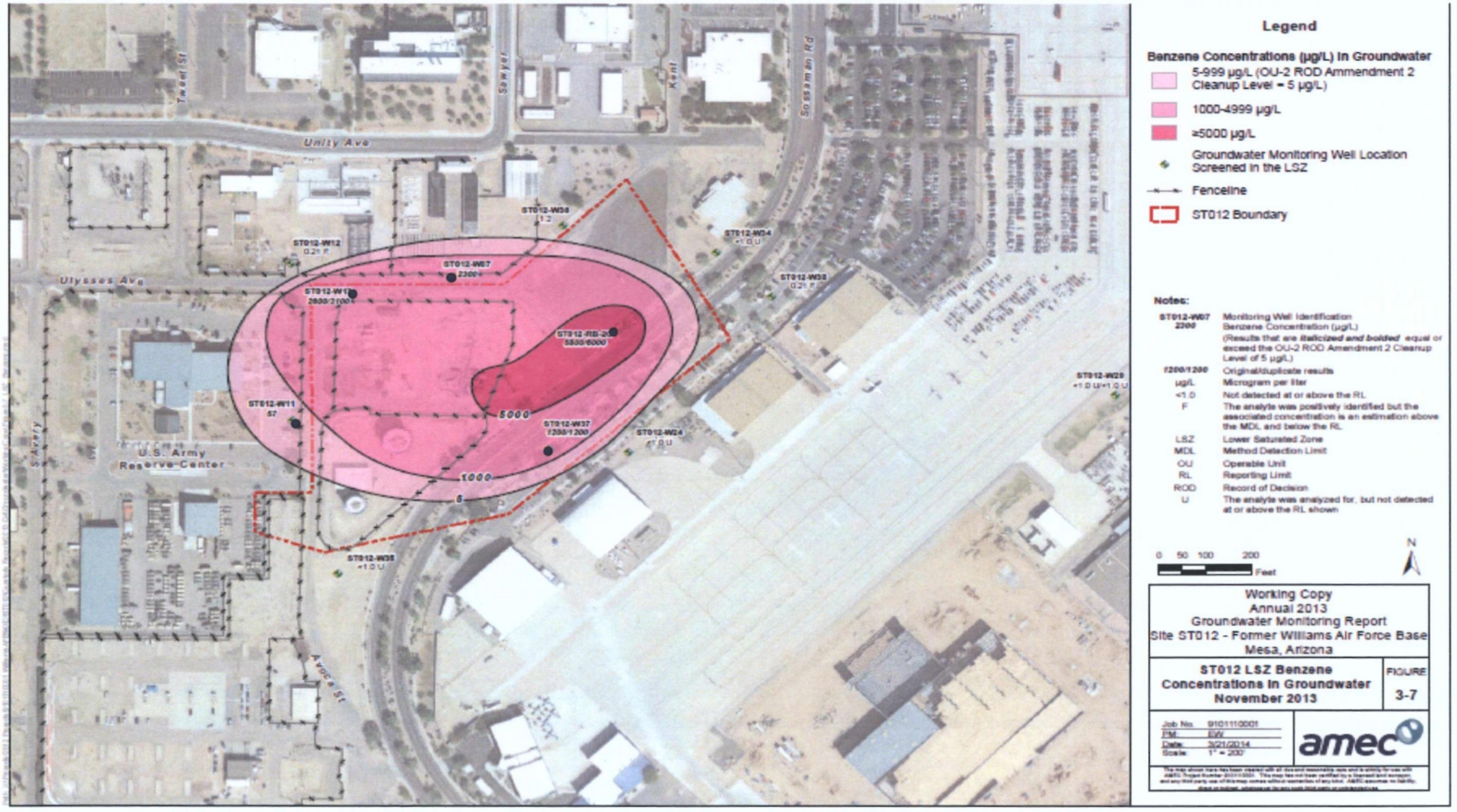
Site ST012 Groundwater Monitoring Update
Nov 2013 Benzene Results UWBZ/CZ



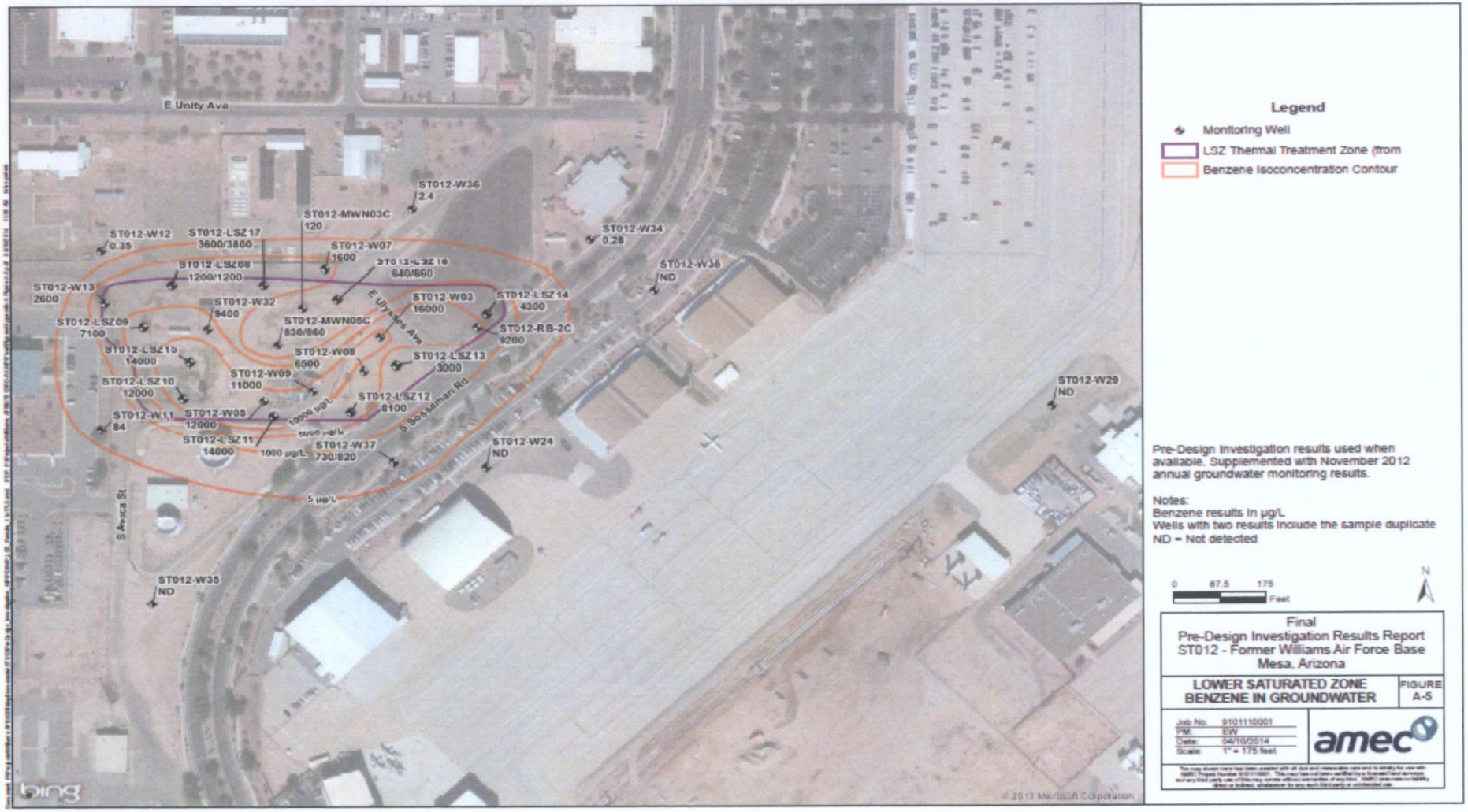
Site ST012 Groundwater Monitoring Update
PDI 2014 Benzene Results UWBZ/CZ



Site ST012 Groundwater Monitoring Update
Nov 2013 Benzene Results LSZ



Site ST012 Groundwater Monitoring Update
PDI 2014 Benzene Results LSZ



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ST012 WEEKLY REPORT

1. Summary

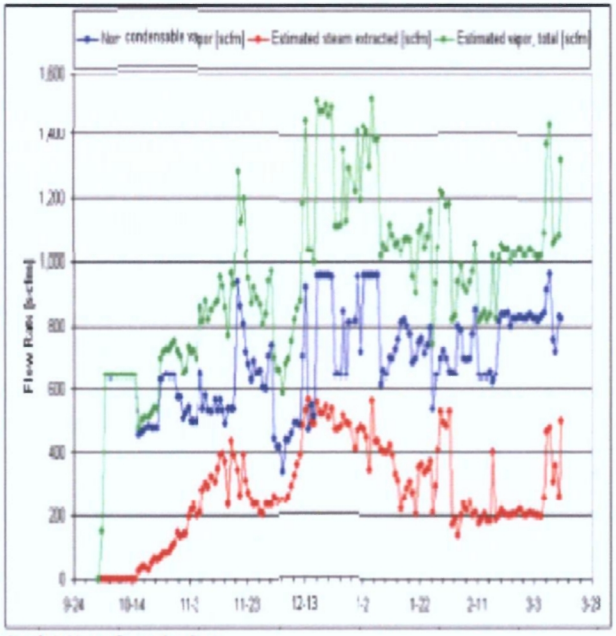
This report is intended to cover the period of operations from December X, 2013 through December Y, 2013. Temperature monitoring point data has been updated through December Z, 2013. The following table provides a summary of the project operational status.

Table 1. Project Summary

Type	Value	Unit
TTZ soil volume	13,387	cy
Area	23,078	ft2
Average depth	16	ft
Heating started	10-02-09	
Estimated total days of operation	150	
Estimated total energy usage (calcs)	5,400,000	kWh
Days of operation	161	days
Energy used to date	4,361,653	kWh
Injected energy per soil volume	244	kWh/cy
Water mass removal based on analytical data	7	lbs
Vapor mass removal based on PID	3,722	lbs
Average temperature TTZ	299	°F
Average power input last 24 hours	1323	kW
Average steam injection rate last 24 hours	0	lbs/hr
Average condensate production rate last 24 hours	2.8	gpm
Average vapor extraction rate (non condensable) last 24 hours	825	scfm

2. Vapor Extraction

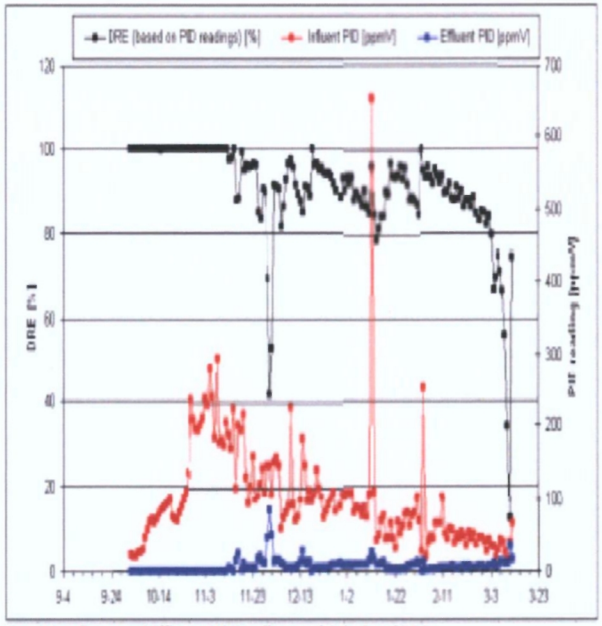
The graph below shows the vapor extraction rate from the site. Note that the estimated steam extraction rate is a calculated value based on the sum of water condensed out in the main manifold and the calculated humidity ratio in vapors drawn into the treatment system.



Graph 1. Vapor Extraction Rate

3. PID and DRE

The following graph depicts the influent and effluent PID readings and the Destruction and Removal Efficiency (DRE) of the treatment system. Note that PID readings of 0.0 ppmV are shown in the graph as 0.01 ppm due to the logarithmic scale that doesn't allow display of 0-values.

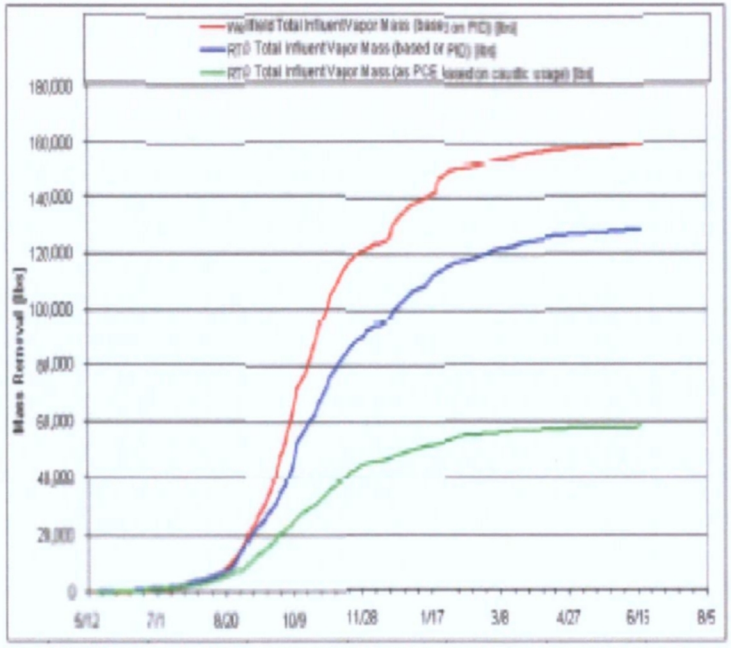


Graph 2. Influent and Effluent PID Readings and Calculated DRE

ST012 WEEKLY REPORT

4. Mass Removal

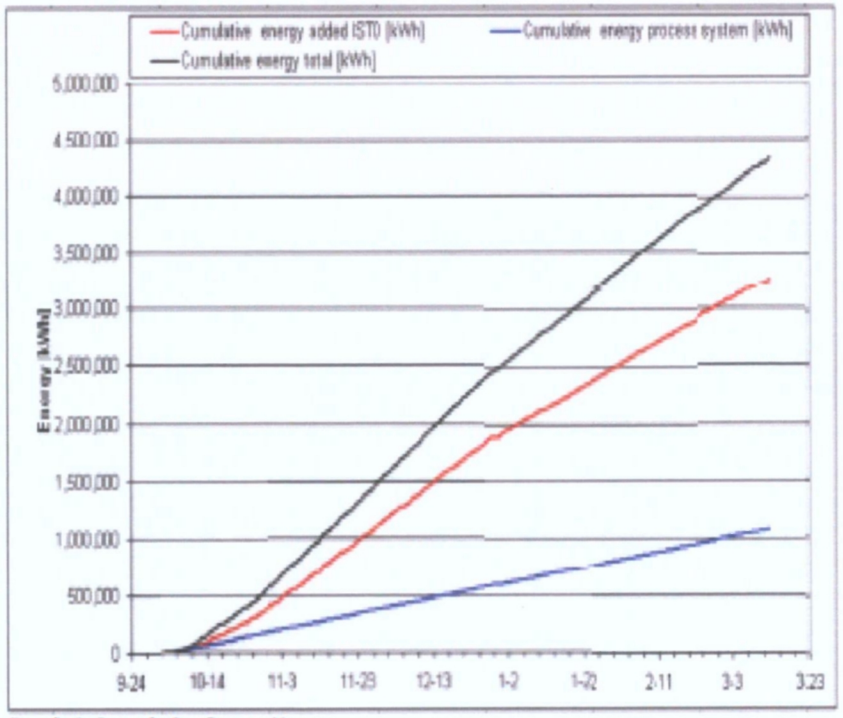
The mass removal is calculated by adjusting the wellfield PID reading based on the correction factors for each major COC identified in the most recent lab analysis. In addition, the mass removal calculation based on caustic usage at the site has been added to the graph below.



Graph 3. Mass Removal

5. Power Usage

The cumulative power usage is shown below. The power used by the treatment system is an estimated value.

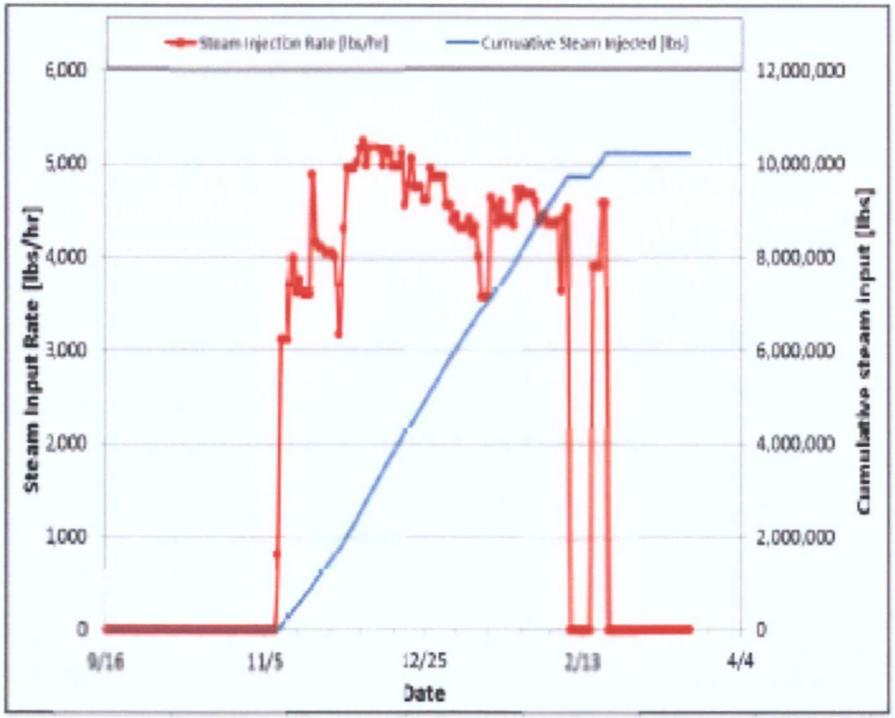


Graph 4. Cumulative Power Usage

ST012 WEEKLY REPORT

6. Steam Injection

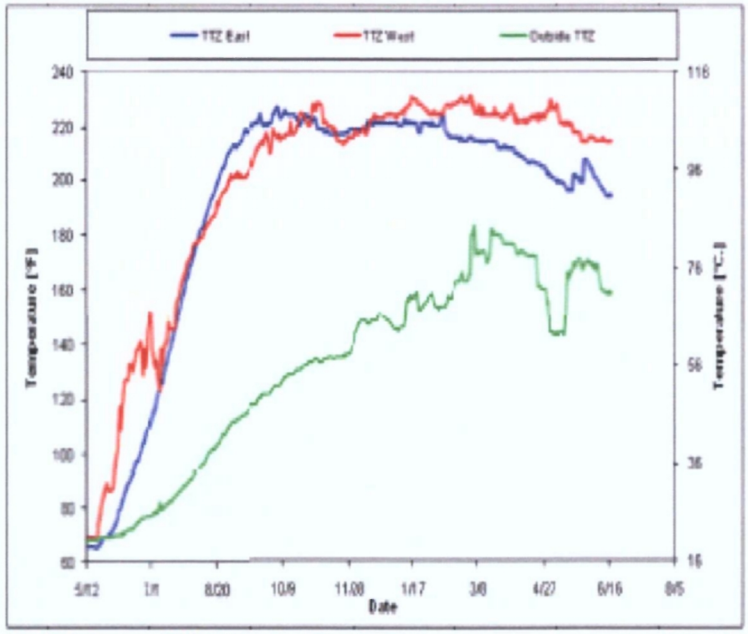
The steam input rate and cumulative steam injection to the site is shown below.



Graph 6. Steam Input Rate

7. Average Temperature

The average soil temperatures for the eastern and western part of the treatment area, as well as background temperatures outside of the treatment area, are shown in the graph below.

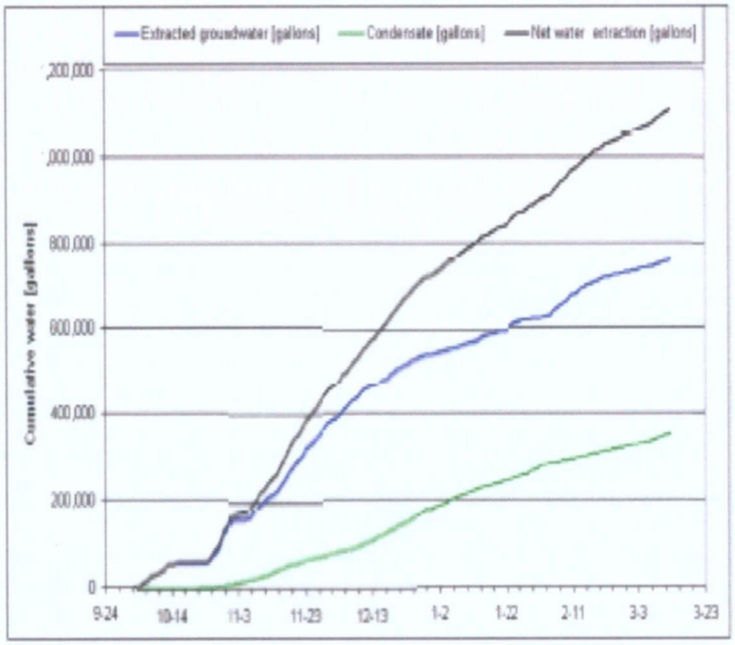


Graph 7. Average Soil Temperatures

ST012 WEEKLY REPORT

8. Cumulative Water Balance

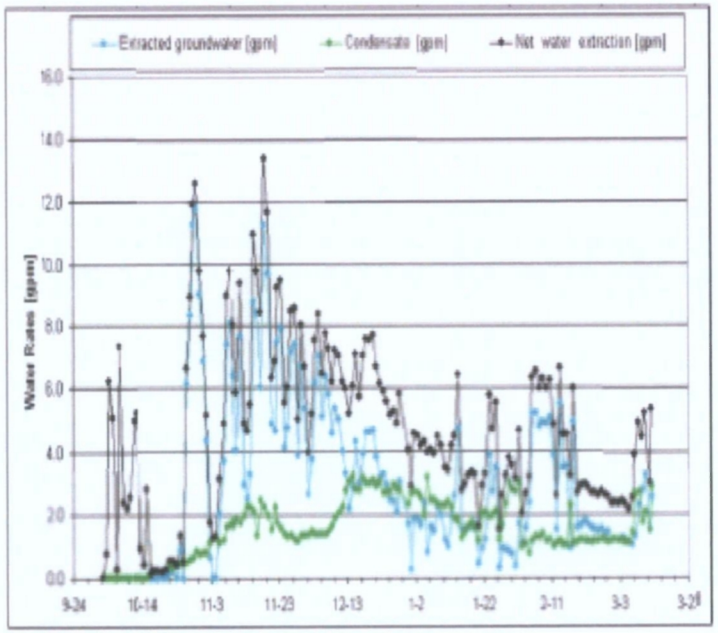
The cumulative water balance is shown below.



Graph 8. Cumulative Water Balance

9. Water Balance Rate

Water injection and extraction rates are shown in the graph below together with the calculated net water extraction rate.



Graph 9. Water Balance Rates

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SITE ST012,
FORMER LIQUID FUELS STORAGE AREA

SAFETY RISKS AND PRECAUTIONS

ST012 RISKS AND PRECAUTIONS

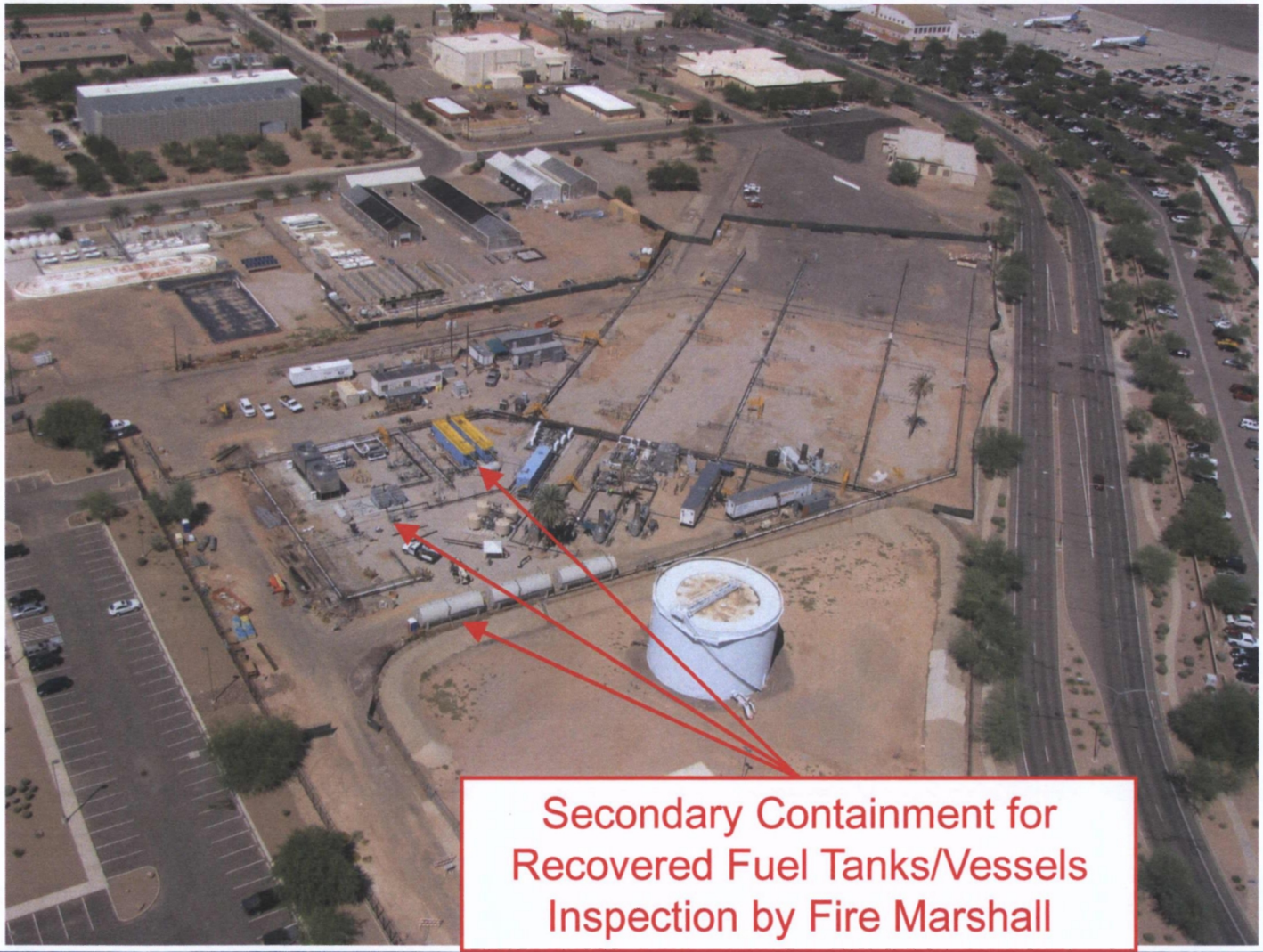
RISK	PRECAUTION
■ High temperatures	■ Barriers and warning signs to protect personnel
■ High working Pressures	■ Pressure testing and limited access
■ Electrical	■ Follows electric code (explosive proof) and work limited to qualified individuals

ST012 RISKS AND PRECAUTIONS

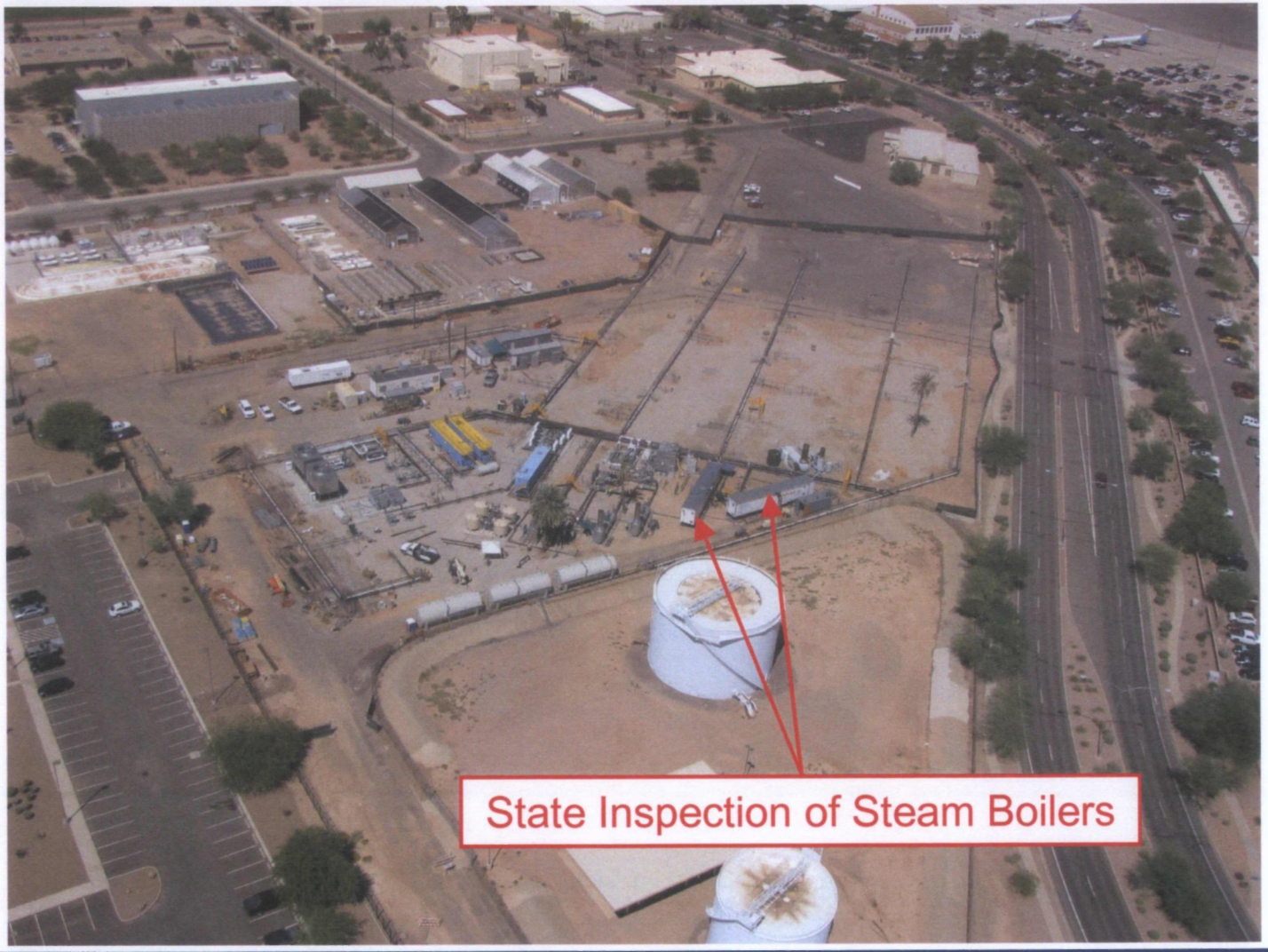
RISK	PRECAUTION
■ Flammable Liquids	■ Containment, intrinsically safe controls, Fire Marshall inspection
■ Steam surfacing via previously abandoned wells	■ Previous well locations on maps for inspection. Driller available to grout if necessary

ST012 Design Safety Features

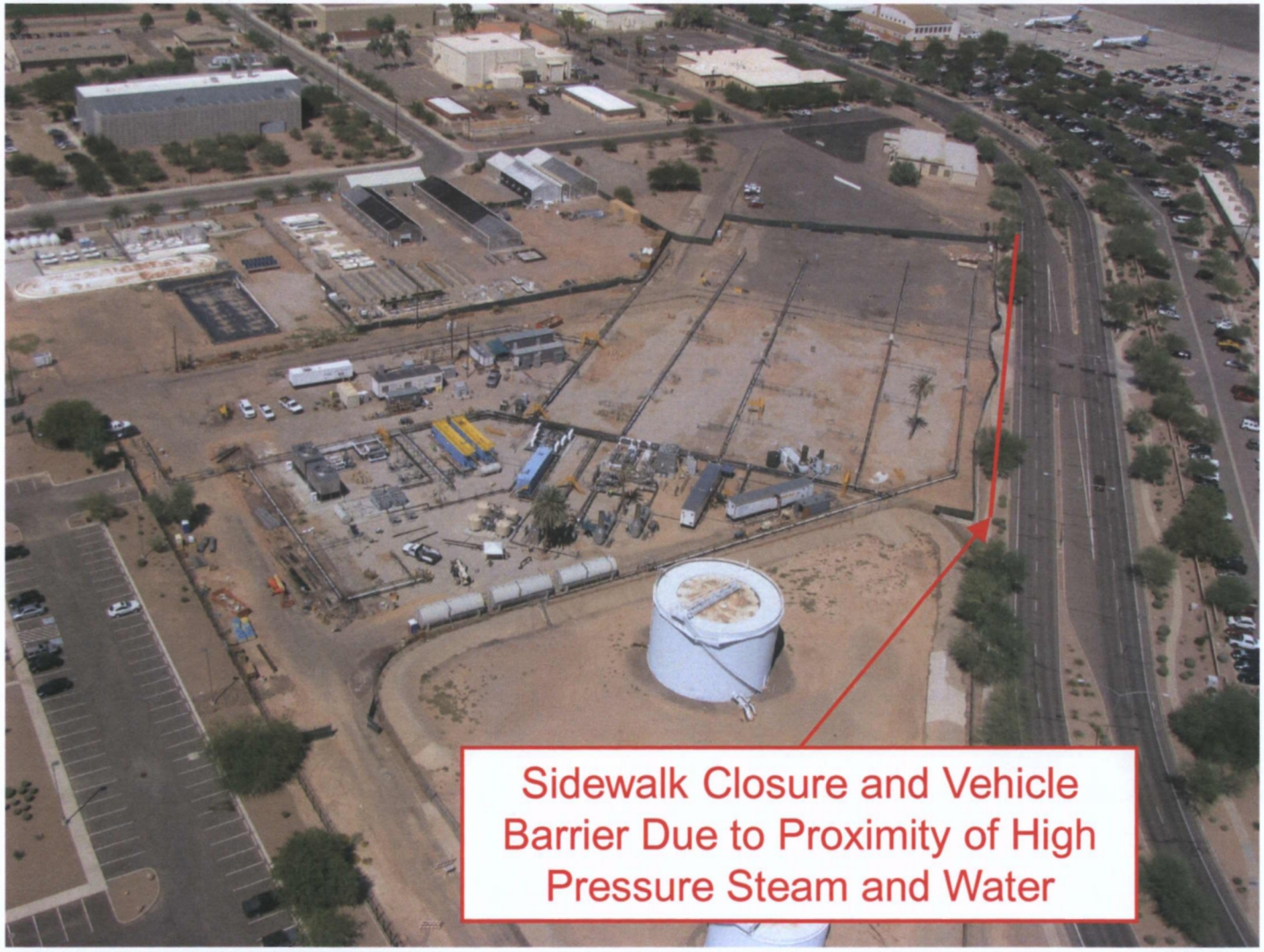
ST012 Design Safety Features



ST012 Design Safety Features



ST012 Design Safety Features

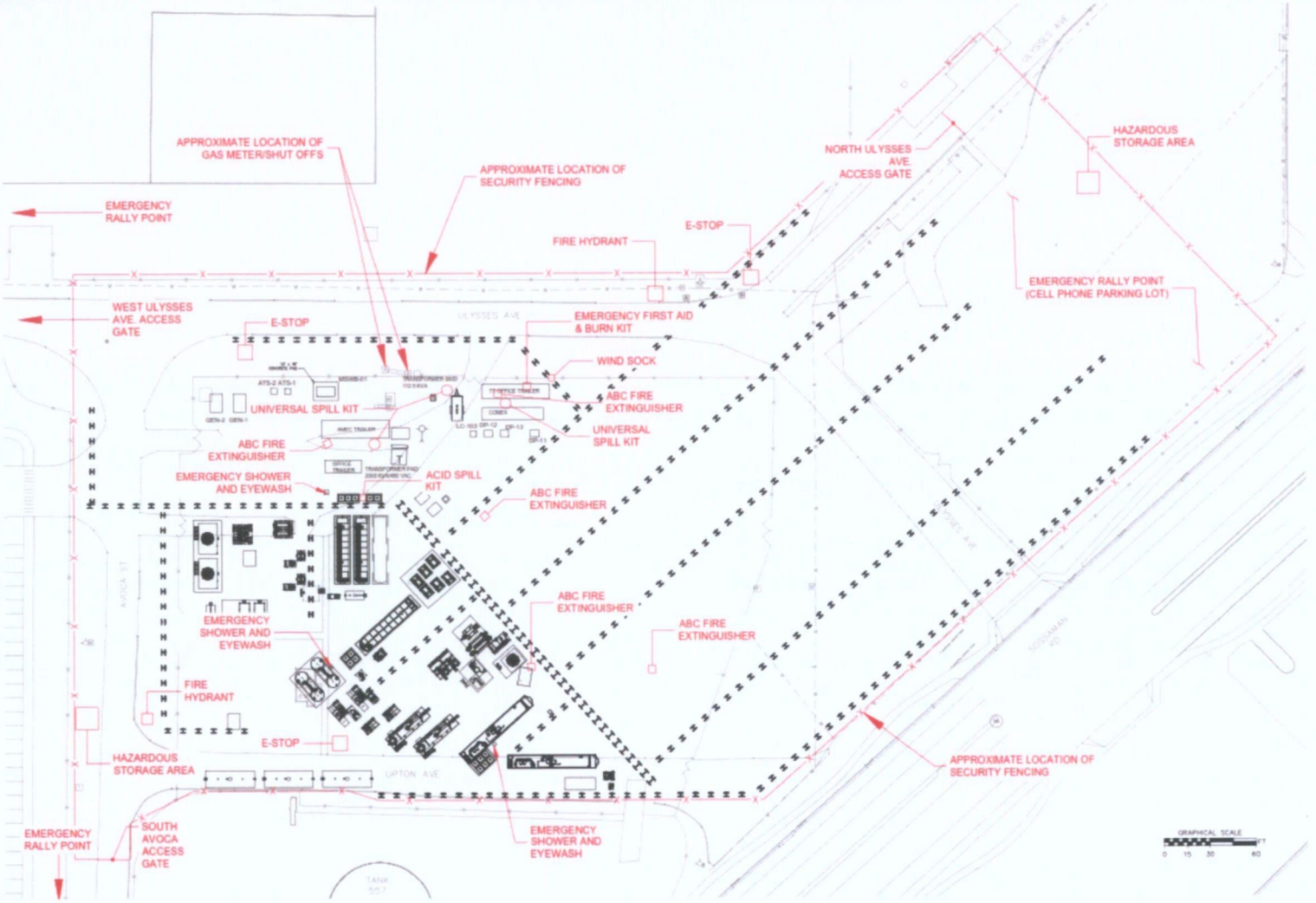


ST012 Design Safety Features

ST012 SAFETY ACTIVITIES

■ Ulysses Ave and Cell Lot Closure	May 2014
■ Construction Safety Audit	Aug 26 2014
■ First Responders Meeting	Aug 27 2014
■ Boiler Inspection	Sep 12 2014
■ Fire Marshall Inspection	Sep 2014

ST012 Emergency Location Plan



Site ST012 SVE System Update

Jan – Mar 2014

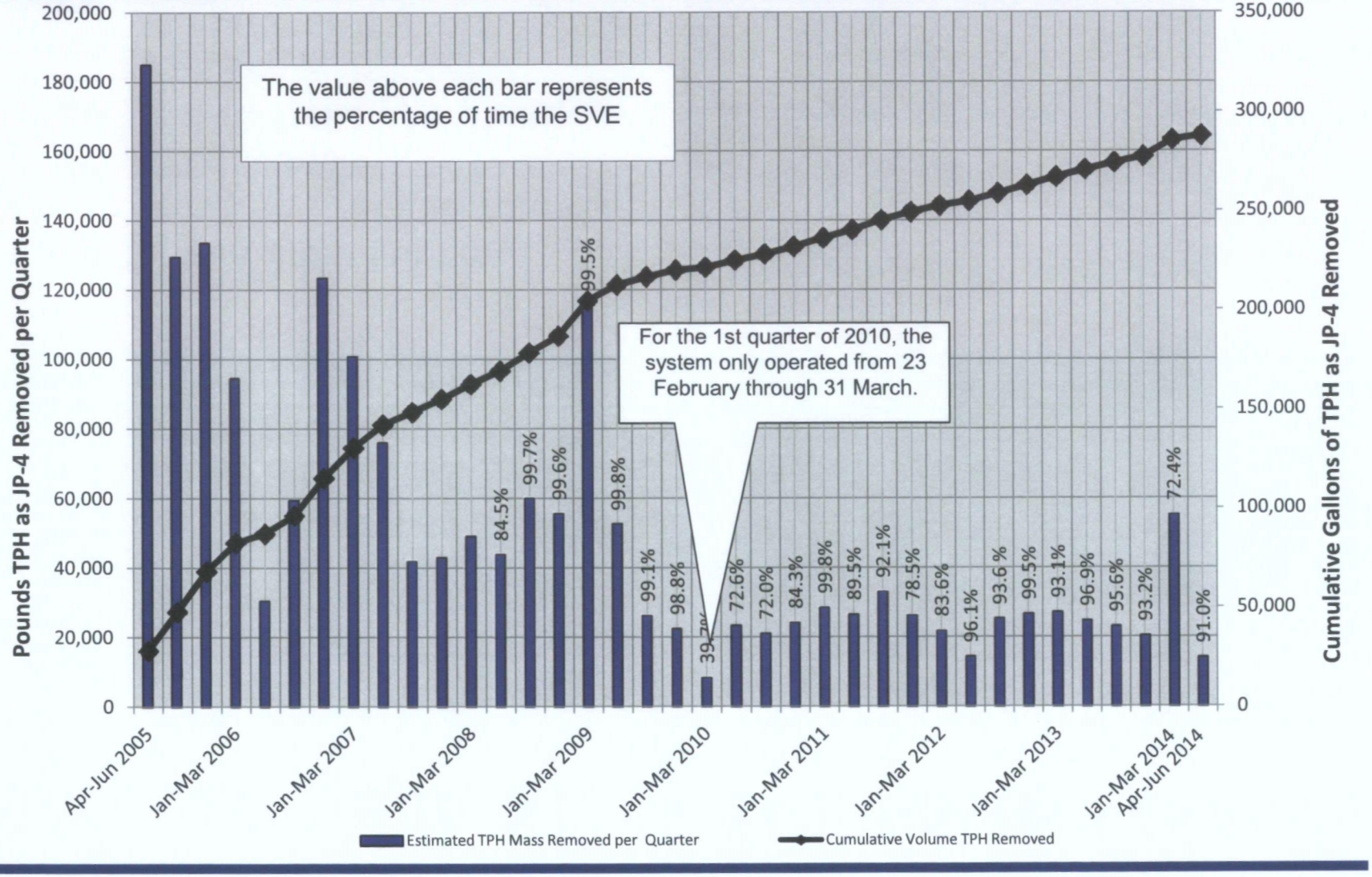
- 72.4% operational uptime
- TPH removed – 55,000 pounds or 8,400 gallons[1] (3,100 gallons in Oct – Dec 2013)

Apr – Jun 2014

- 91.0% operational uptime
- TPH removed – 14,000 pounds or 2,200 gallons
- 9 of 27 SVE wells operating (same as Oct – Dec 2013)

1 Confirmation samples taken in Apr-Jun quarter indicate mass removed for Jan-Mar was likely an overestimate

Site ST012 SVE System Performance



Site ST012 SVE System Summary

- TPH removed thru June 2014 – 287,300 gallons
- SVE Operations shut down in February for SEE utility installation (restarted on 17 Mar 2014)
- Deep SVE wells disconnected in Aug 2014; new SVE wells will be added to SVE operations in Sep 2014
- Next SVE performance monitoring – Sep 2014
- Mass removal for the SVE system is likely to increase during SEE operations.

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2014 LOOK AHEAD

DOCUMENTS

MEETINGS/CONFERENCE CALLS

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BCT GENERAL UPDATE

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ACTION ITEMS